



Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Sonar Probe Bottom Condition

- Soft
- Medium
- Hard

Historic Fines Percentage

- ≤ 35%
- > 35%

River Mile Marker

Approximate River Centerline

Buffer Based On Hard Bottom Designation

Sample Placement Analysis Extent

Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4. Biosonar ® transducer used for mudline bottom hardness screening, followed by 18" long hand push probe, and visual confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.



Upriver 2018 Soft Sediment Probing Data RM 11.8 to 14

Portland Harbor Superfund Site
PDI Surface Sediment FSP

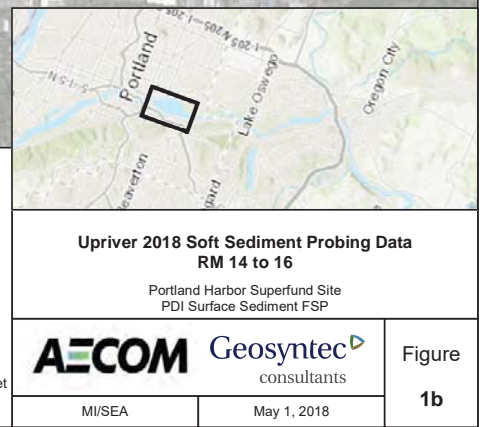
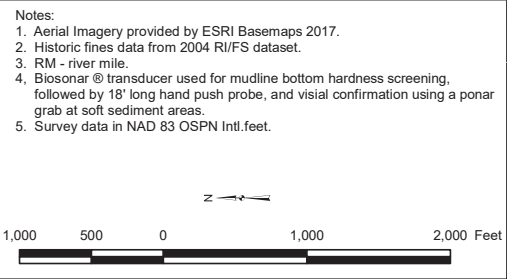
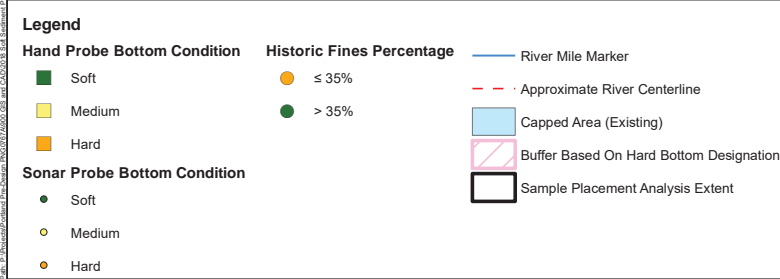
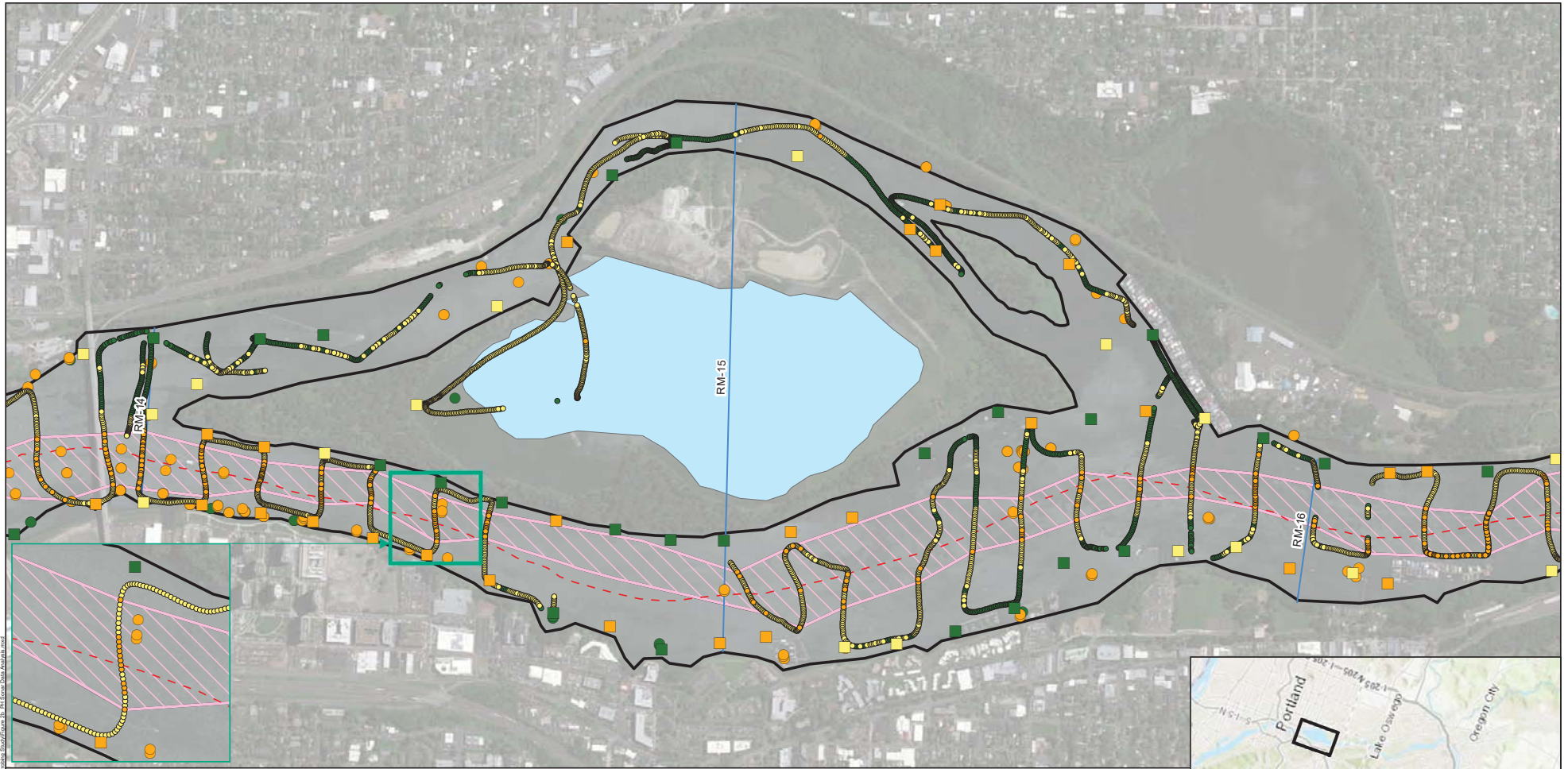
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Figure

1a





Path: D:\Projects\Upriver 2018 Soft Sediment Probing Data\GIS\Map_Series\Upriver 2018 Soft Sediment Probing Data_Series.mxd

Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Sonar Probe Bottom Condition

- Soft
- Medium
- Hard

Historic Fines Percentage

- ≤ 35%
- > 35%

— River Mile Marker

- - - Approximate River Centerline

□ Buffer Based On Hard Bottom Designation

□ Sample Placement Analysis Extent

Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4. Biosonar ® transducer used for mudline bottom hardness screening, followed by 18" long hand push probe, and visual confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.



Upriver 2018 Soft Sediment Probing Data RM 16 to 18

Portland Harbor Superfund Site
PDI Surface Sediment FSP

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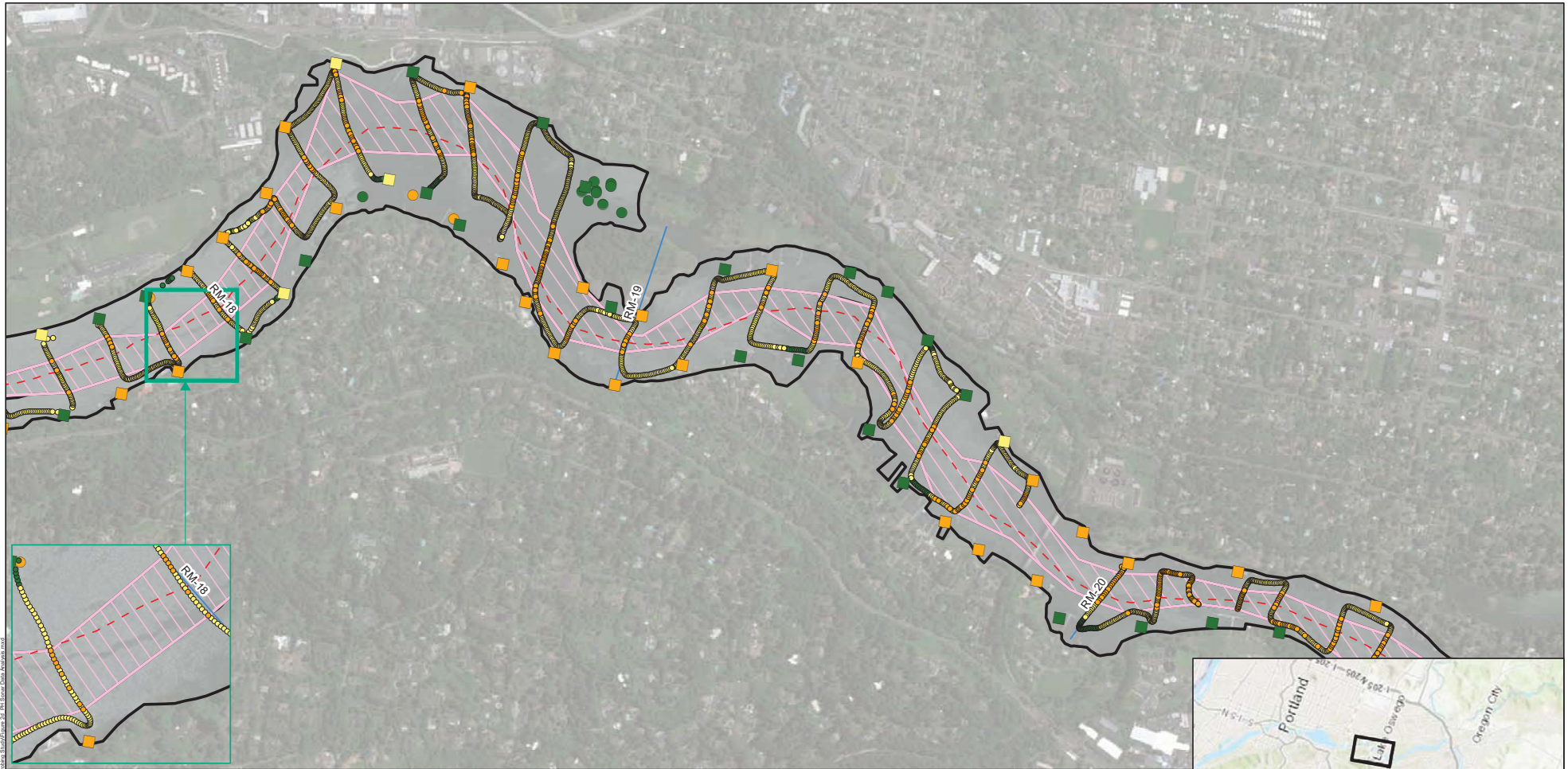
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Figure

1c



File: D:\Projects\Upriver 2018 Soft Sediment Probing Data\Map\Upriver 2018 Soft Sediment Probing Data\Map\Upriver 2018 Soft Sediment Probing Data\Map\Upriver 2018 Soft Sediment Probing Data.mxd

Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Sonar Probe Bottom Condition

- Soft
- Medium
- Hard

Historic Fines Percentage

- ≤ 35%
- > 35%

River Mile Marker

Approximate River Centerline

Buffer Based On Hard Bottom Designation

Sample Placement Analysis Extent

Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4. Biosonar ® transducer used for mudline bottom hardness screening, followed by 18" long hand push probe, and visual confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.



Upriver 2018 Soft Sediment Probing Data RM 18 to 20

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PDI Surface Sediment FSP

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Figure

1d



Path: D:\Projects\Upriver 2018 Soft Sediment Probing Data\Map\Map_2018_Soft_Sediment_Probing_Data.mxd

Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Sonar Probe Bottom Condition

- Soft
- Medium
- Hard

Historic Fines Percentage

- ≤ 35%
- > 35%

River Mile Marker

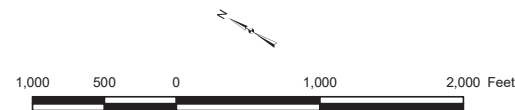
Approximate River Centerline

Buffer Based On Hard Bottom Designation

Sample Placement Analysis Extent

Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4. Biosonar ® transducer used for mudline bottom hardness screening, followed by 18" long hand push probe, and visual confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.



Upriver 2018 Soft Sediment Probing Data RM 20 to 22

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PDI Surface Sediment FSP

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Figure

1e



Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Sonar Probe Bottom Condition

- Soft
- Medium
- Hard

Historic Fines Percentage

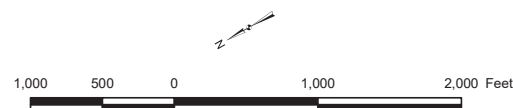
- ≤ 35%
- > 35%

River Mile Marker

- Approximate River Centerline
- Buffer Based On Hard Bottom Designation
- Sample Placement Analysis Extent

Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4. Biosonar ® transducer used for mudline bottom hardness screening, followed by 18" long hand push probe, and visual confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.



Upriver 2018 Soft Sediment Probing Data RM 27 to 28.6

Portland Harbor Superfund Site
PDI Surface Sediment FSP

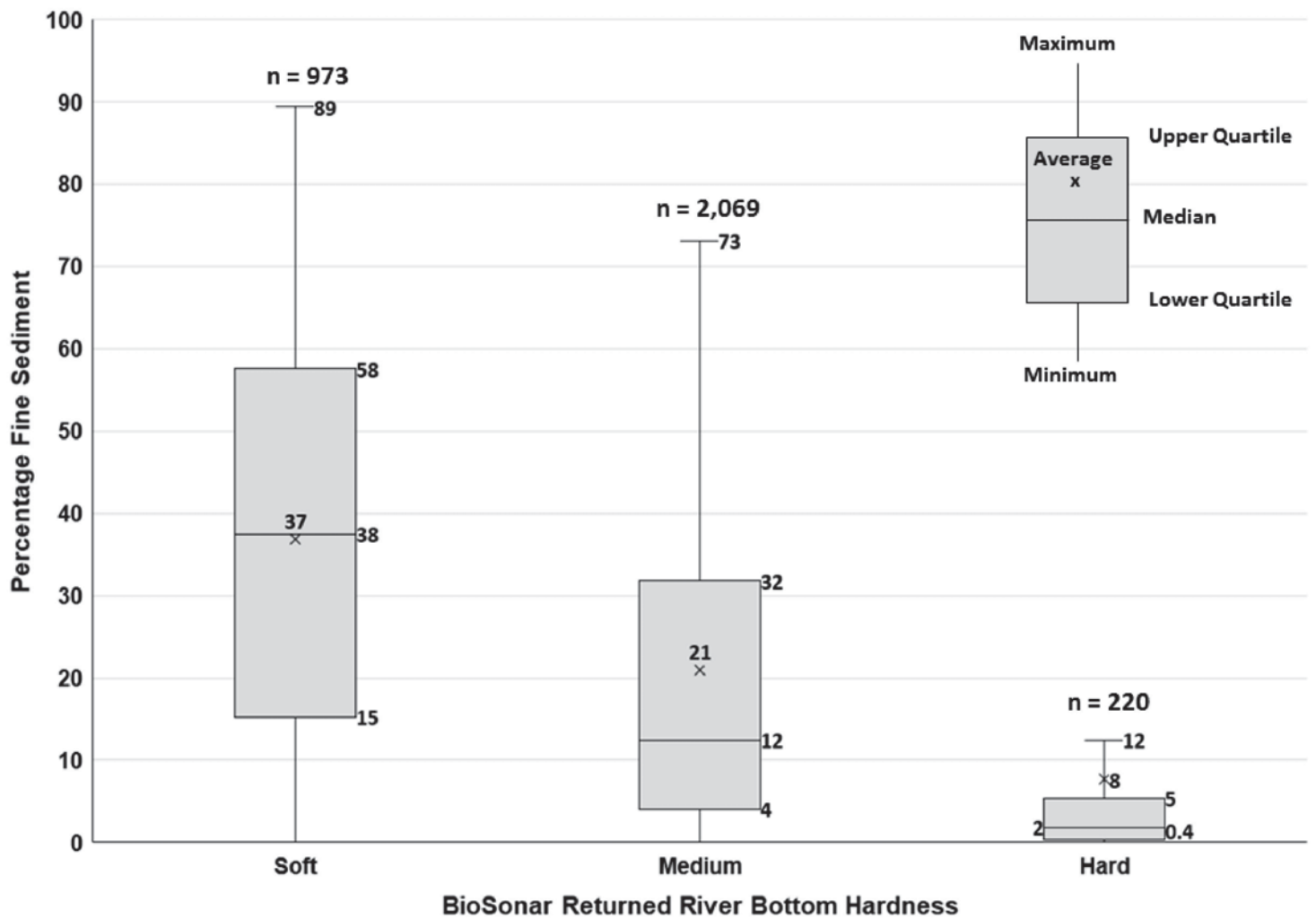
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Figure

1h



Note:
Data provided in Figure 2 was collected on 2 April, 2018 with the use of a single beam sonar and analyzed through BioSonar®. Over 15,000 sonar points were recorded and then compared against sediment grab data points. The BioSonar® data located within 100 feet of a sediment Grab Data point was compared against the percent fines of that grab. The comparison was used to determine the statistical accuracy of the BioSonar® data with a total of 3,262 data points analyzed. Figure 2 shows that statistically hard BioSonar® data is not likely to contain soft sediment based on sediment grab data comparison.

BioSonar® Data Located within 100ft Radius of a Sediment Grab Data Point Compared to Percent Fines of that Data Point

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Figure

2

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Data: Aerial Imagery provided by ESRI Basemaps 2017. Historic fines data from 2004 RI/FS dataset. RM - river mile. Biosonar @ trasducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visual confirmation using a ponar grab at soft sediment areas. Survey data in NAD 83 OSPN Intl. feet.

Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Hand Probe Derived Bottom Condition Polygons

- Soft
- Medium
- Hard

Historic Fines Percentage

- ≤ 35%
- > 35%

- River Mile Marker
- Approximate River Centerline
- Buffer Based On Hard Bottom Designation
- Sample Placement Analysis Extent

- Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
 2. Historic fines data from 2004 RI/FS dataset.
 3. RM - river mile.
 4. Biosonar @ trasducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visual confirmation using a ponar grab at soft sediment areas.
 5. Survey data in NAD 83 OSPN Intl. feet.



2018 Interpolated Upriver Areas of Soft Sediment RM 11.8 to 14

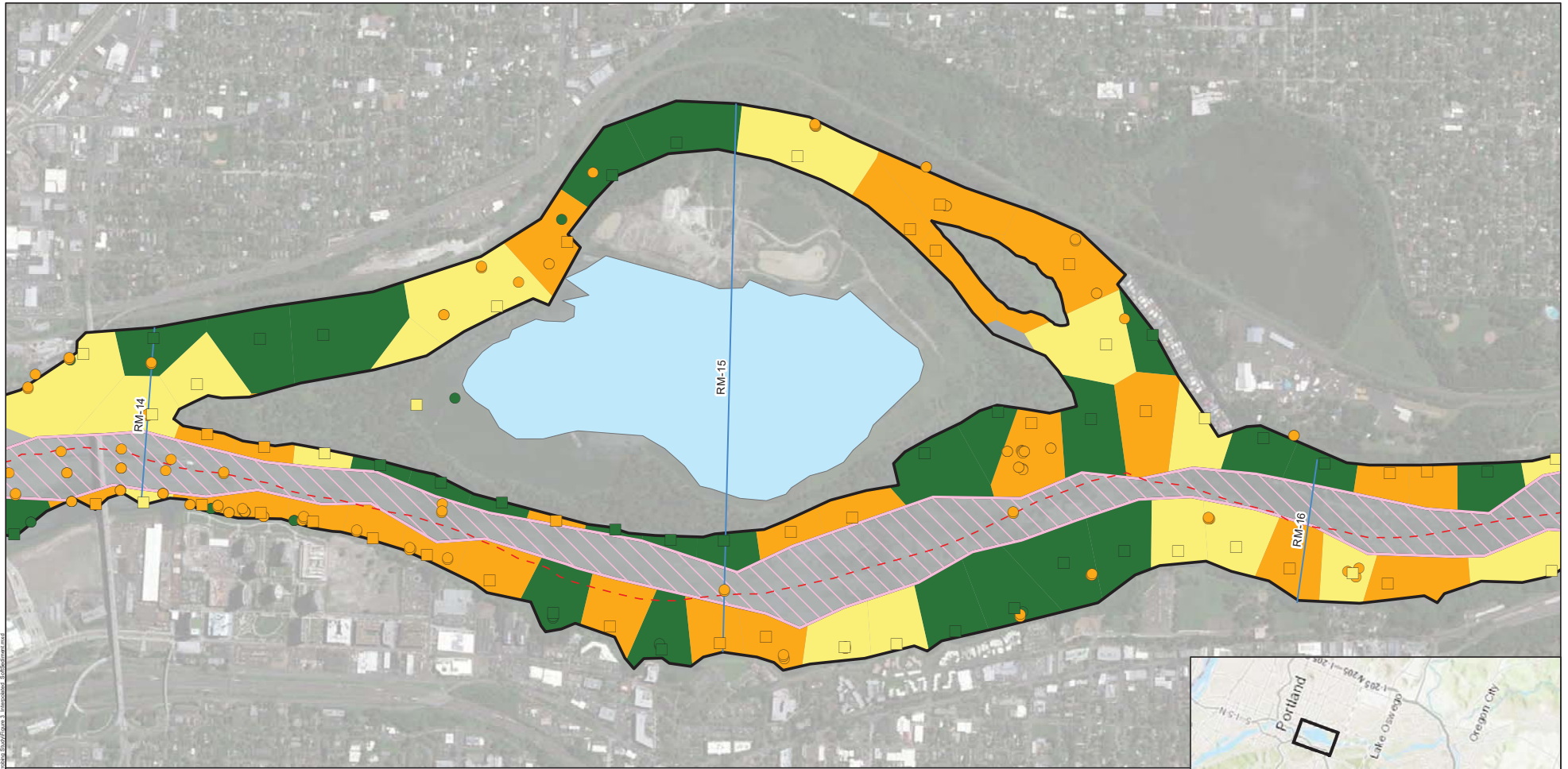
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PDI Surface Sediment FSP

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Figure
3a



Data: Aerial Imagery provided by ESRI Basemaps 2017. Historic fines data from 2004 RI/FS dataset. RM - river mile. Biosonar @ transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visual confirmation using a ponar grab at soft sediment areas. Survey data in NAD 83 OSPN Intl. feet.

Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Hand Probe Derived Bottom Condition Polygons

- Soft
- Medium
- Hard

Historic Fines Percentage

- ≤ 35%
- > 35%

- River Mile Marker
- Approximate River Centerline
- Capped Area (Existing)
- Buffer Based On Hard Bottom Designation
- Sample Placement Analysis Extent

- Notes:**
1. Aerial Imagery provided by ESRI Basemaps 2017.
 2. Historic fines data from 2004 RI/FS dataset.
 3. RM - river mile.
 4. Biosonar @ transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visual confirmation using a ponar grab at soft sediment areas.
 5. Survey data in NAD 83 OSPN Intl. feet.



**2018 Interpolated Upriver Areas of Soft Sediment
RM 14 to 16**

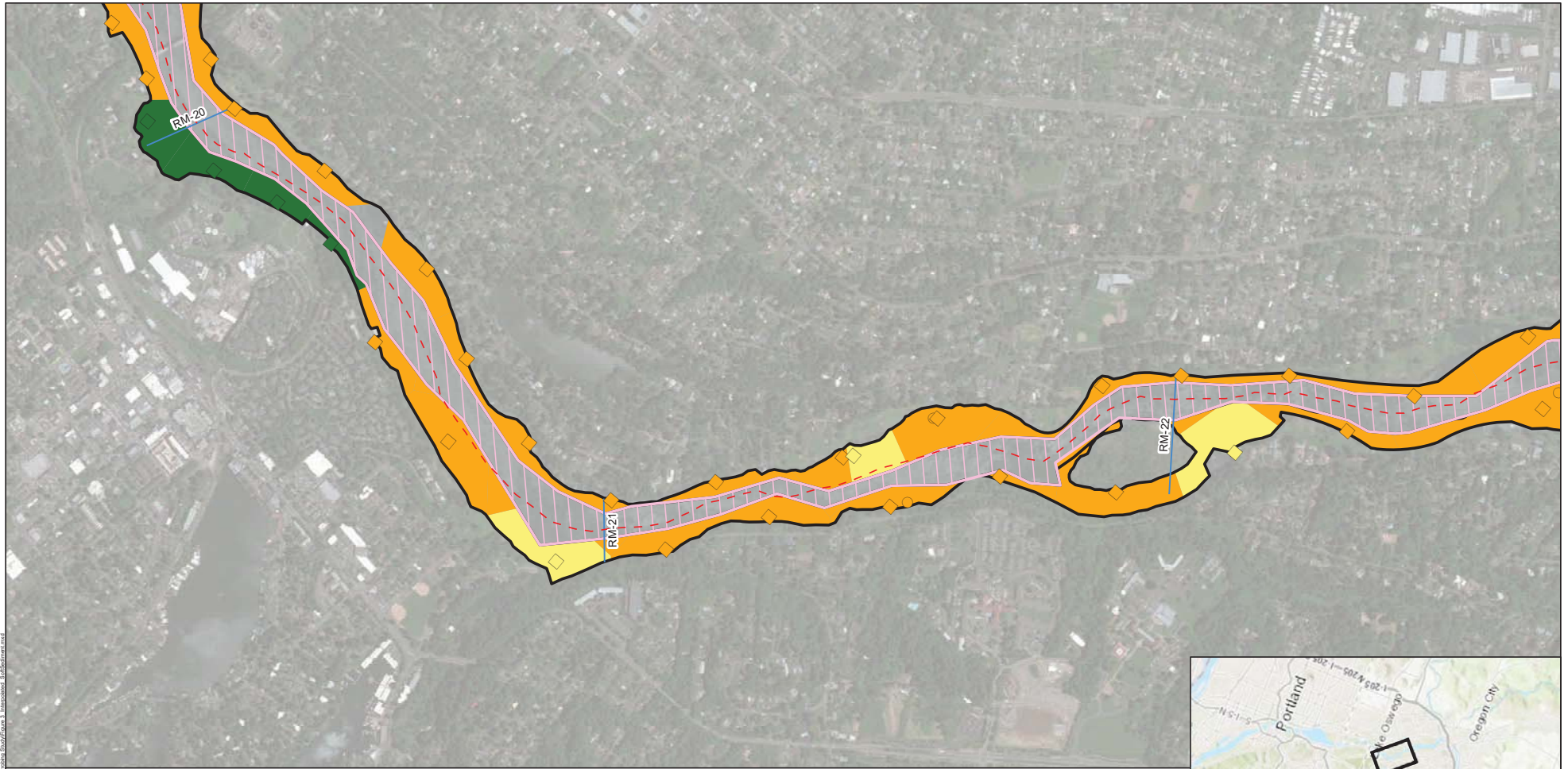
Portland Harbor Superfund Site
PDI Surface Sediment FSP

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Figure
3b



Data: Aerial Imagery provided by ESRI Basemaps 2017. Historic fines data from 2004 RI/FS dataset. RM - river mile. Biosonar @ transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visual confirmation using a ponar grab at soft sediment areas. Survey data in NAD 83 OSPN Intl. feet.

Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Hand Probe Derived Bottom Condition Polygons

- Soft
- Medium
- Hard

Historic Fines Percentage

- ≤ 35%
- > 35%

River Mile Marker

Approximate River Centerline

Buffer Based On Hard Bottom Designation

Sample Placement Analysis Extent

Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4. Biosonar @ transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visual confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl. feet.



**2018 Interpolated Upriver Areas of Soft Sediment
RM 20 to 22**

Portland Harbor Superfund Site
PDI Surface Sediment FSP

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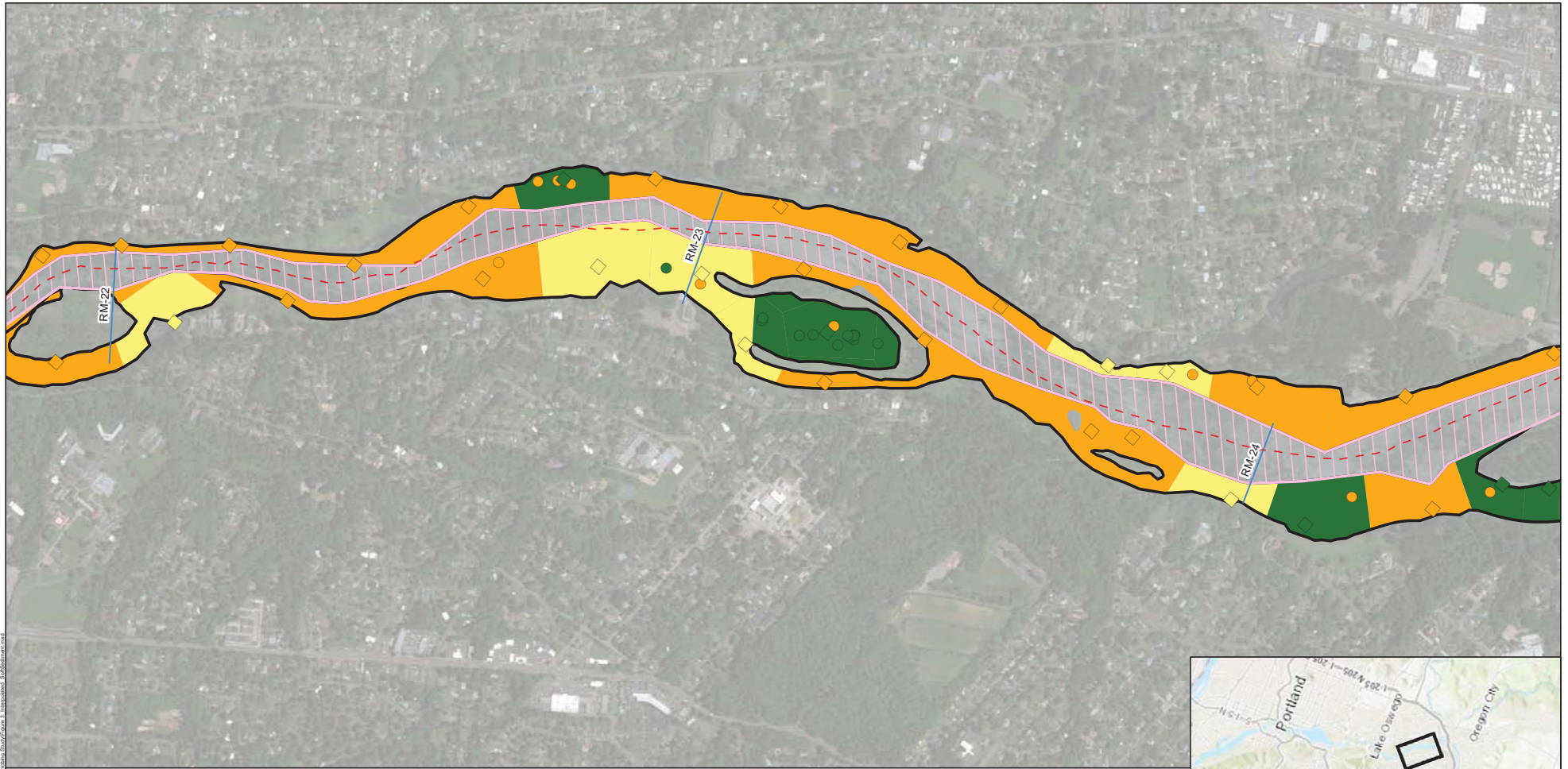
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Figure

3e



Data: Aerial Imagery provided by ESRI Basemaps 2017. Historic fines data from 2004 RI/FS dataset. RM - river mile. Biosonar @ transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visual confirmation using a ponar grab at soft sediment areas. Survey data in NAD 83 OSPN Intl. feet.

Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Hand Probe Derived Bottom Condition Polygons

- Soft
- Medium
- Hard

Historic Fines Percentage

- ≤ 35%
- > 35%

- River Mile Marker
- Approximate River Centerline
- Buffer Based On Hard Bottom Designation
- Sample Placement Analysis Extent

- Notes:**
1. Aerial Imagery provided by ESRI Basemaps 2017.
 2. Historic fines data from 2004 RI/FS dataset.
 3. RM - river mile.
 4. Biosonar @ transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visual confirmation using a ponar grab at soft sediment areas.
 5. Survey data in NAD 83 OSPN Intl. feet.



**2018 Interpolated Upper Areas of Soft Sediment
RM 22 to 24**

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Figure
3f



Data: Aerial Imagery provided by ESRI Basemaps 2017. Historic fines data from 2004 RI/FS dataset. RM - river mile. Biosonar @ transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visual confirmation using a ponar grab at soft sediment areas. Survey data in NAD 83 OSPN Intl. feet.

Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Hand Probe Derived Bottom Condition Polygons

- Soft
- Medium
- Hard

Historic Fines Percentage

- ≤ 35%
- > 35%

River Mile Marker

Approximate River Centerline

Buffer Based On Hard Bottom Designation

Sample Placement Analysis Extent

Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4. Biosonar @ transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visual confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl. feet.



**2018 Interpolated Upriver Areas of Soft Sediment
RM 24 to 26**

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PDI Surface Sediment FSP

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Figure

3g



Data: Aerial Imagery provided by ESRI Basemaps 2017. Historic fines data from 2004 RI/FS dataset. RM - river mile. Biosonar @ transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visual confirmation using a ponar grab at soft sediment areas. Survey data in NAD 83 OSPN Intl. feet.

Legend

Hand Probe Bottom Condition

- Soft
- Medium
- Hard

Hand Probe Derived Bottom Condition Polygons

- Soft
- Medium
- Hard

Historic Fines Percentage

- ≤ 35%
- > 35%

— River Mile Marker

- - - Approximate River Centerline

Buffer Based On Hard Bottom Designation

Sample Placement Analysis Extent

Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Historic fines data from 2004 RI/FS dataset.
3. RM - river mile.
4. Biosonar @ transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visual confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl. feet.



**2018 Interpolated Upriver Areas of Soft Sediment
RM 27 to 28.6**

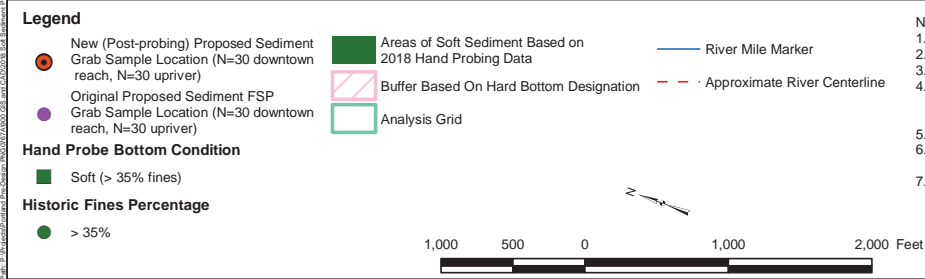
Portland Harbor Superfund Site
PDI Surface Sediment FSP

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Figure
3h



Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Downtown Reach defined as (RM 11.8 -16.6) and the Upriver Reach (RM 16.6 - 28.4).
3. RM - river mile.
4. Biosonar® transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visual confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.
6. The approximate lateral distance along the shore used to define the Analysis Grids was approximately 675 ft in the Downtown reach and 950 ft in the Upriver reach.
7. Points were generated randomly inside the Hand Probe Thiessen Polygons within each of the Analysis Grids using the Create Random Points tool in ArcGIS 10. The 60 proposed grab locations were divided (30 ea) between the Downtown and the Upriver Reaches.



**Proposed Downtown/Upriver Reach
Surface Grab Locations (revised)
RM 11.8 to 14**

Portland Harbor Superfund Site
PDI Surface Sediment FSP

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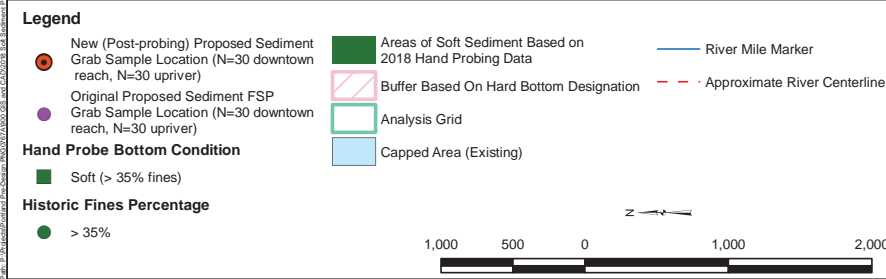
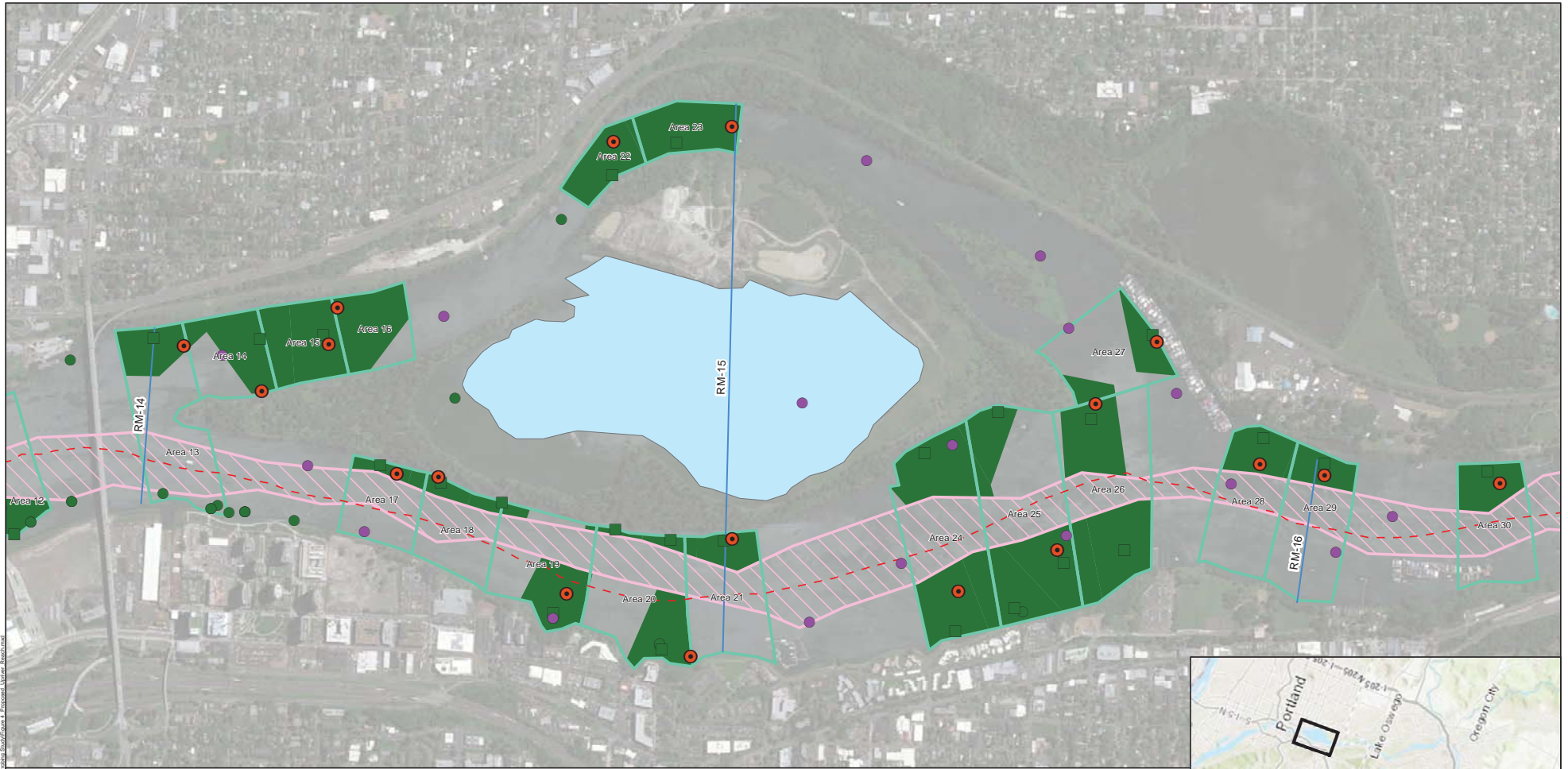
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Figure

4a



- Notes:
1. Aerial Imagery provided by ESRI Basemaps 2017.
 2. Downtown Reach defined as (RM 11.8 -16.6) and the Upriver Reach (RM 16.6 - 28.4).
 3. RM - river mile.
 4. Biosonar® transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visual confirmation using a ponar grab at soft sediment areas.
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 7. Points were generated randomly inside the Hand Probe Thiessen Polygons within each of the Analysis Grids using the Create Random Points tool in ArcGIS 10. The 60 proposed grab locations were divided (30 ea) between the Downtown and the Upriver Reaches.



**Proposed Downtown/Upriver Reach
Surface Grab Locations (revised)
RM 14 to 16**

Portland Harbor Superfund Site
PDI Surface Sediment FSP

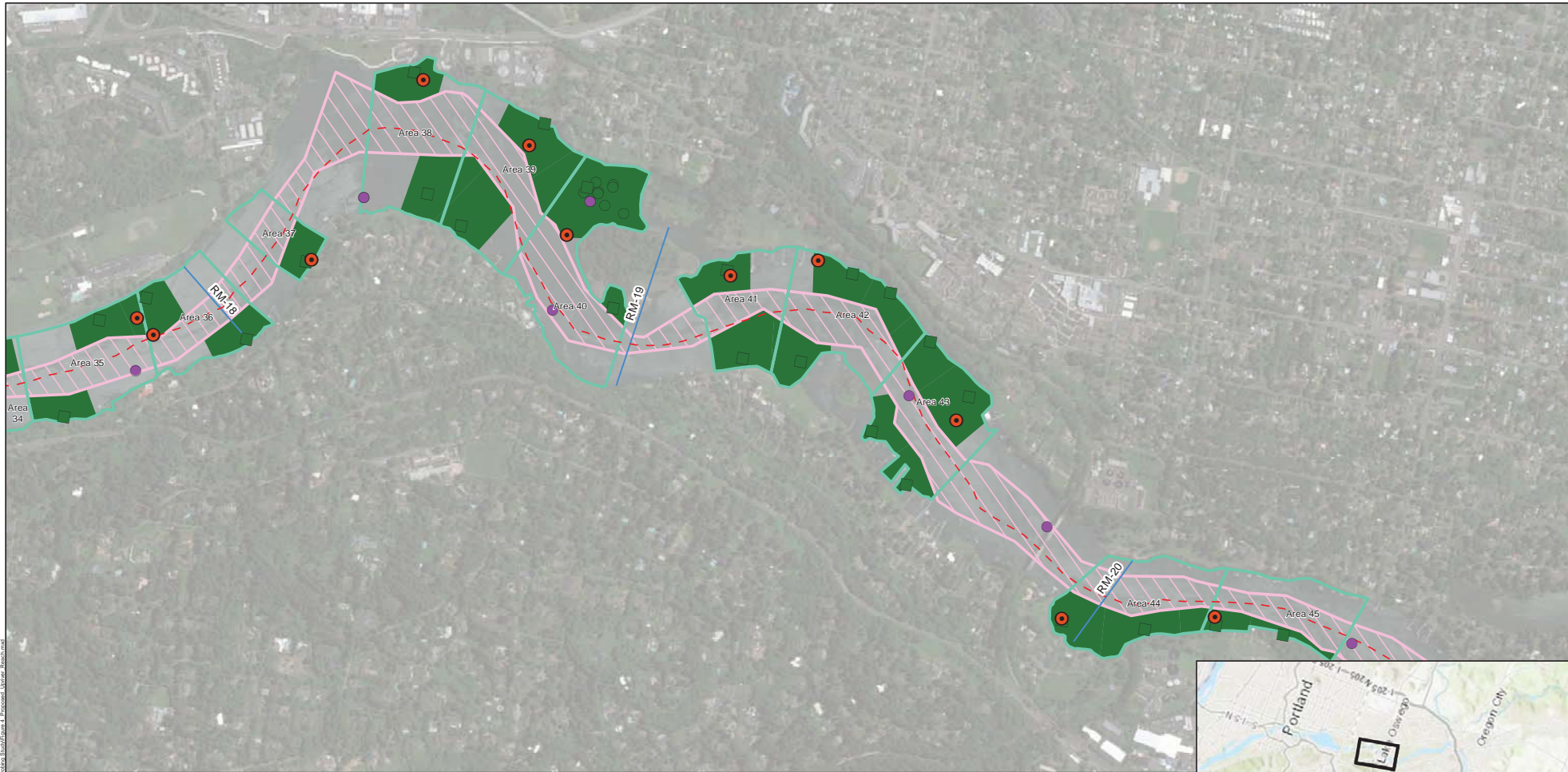
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Figure

4b



Legend

- New (Post-probing) Proposed Sediment Grab Sample Location (N=30 downtown reach, N=30 upriver)
- Original Proposed Sediment FSP Grab Sample Location (N=30 downtown reach, N=30 upriver)
- Areas of Soft Sediment Based on 2018 Hand Probing Data
- Buffer Based On Hard Bottom Designation
- River Mile Marker
- Approximate River Centerline
- Analysis Grid

Hand Probe Bottom Condition

- Soft (> 35% fines)

Historic Fines Percentage

- > 35%

1,000 500 0 1,000 2,000 Feet

Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Downtown Reach defined as (RM 11.8 - 16.6) and the Upriver Reach (RM 16.6 - 28.4).
3. RM - river mile.
4. Biosonar® transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visual confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl. feet.
6. The approximate lateral distance along the shore used to define the Analysis Grids was approximately 675 ft in the Downtown reach and 950 ft in the Upriver reach.
7. Points were generated randomly inside the Hand Probe Thiessen Polygons within each of the Analysis Grids using the Create Random Points tool in ArcGIS 10. The 60 proposed grab locations were divided (30 ea) between the Downtown and the Upriver Reaches.



Proposed Downtown/Upriver Reach Surface Grab Locations (revised) RM 18 to 20

Portland Harbor Superfund Site
PDI Surface Sediment FSP

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Figure

4d



Path: D:\GIS\Projects\Portland Harbor Superfund Site\GIS\Map_Series\Map_Series_4_Proposed_Upriver_Reach.mxd

Legend

- New (Post-probing) Proposed Sediment Grab Sample Location (N=30 downtown reach, N=30 upriver)
- Original Proposed Sediment FSP Grab Sample Location (N=30 downtown reach, N=30 upriver)
- Areas of Soft Sediment Based on 2018 Hand Probing Data
- Buffer Based On Hard Bottom Designation
- Analysis Grid
- River Mile Marker
- Approximate River Centerline

Hand Probe Bottom Condition

- Soft (> 35% fines)

Historic Fines Percentage

- > 35%



Notes:

1. Aerial Imagery provided by ESRI Basemaps 2017.
2. Downtown Reach defined as (RM 11.8 -16.6) and the Upriver Reach (RM 16.6 - 28.4).
3. RM - river mile.
4. Biosonar® transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visual confirmation using a ponar grab at soft sediment areas.
5. Survey data in NAD 83 OSPN Intl.feet.
6. The approximate lateral distance along the shore used to define the Analysis Grids was approximately 675 ft in the Downtown reach and 950 ft in the Upriver reach.
7. Points were generated randomly inside the Hand Probe Thiessen Polygons within each of the Analysis Grids using the Create Random Points tool in ArcGIS 10. The 60 proposed grab locations were divided (30 ea) between the Downtown and the Upriver Reaches.



Proposed Downtown/Upriver Reach Surface Grab Locations (revised) RM 20 to 22

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PDI Surface Sediment FSP

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May 11, 2018

Figure

4e



Legend

- New (Post-probing) Proposed Sediment Grab Sample Location (N=30 downtown reach, N=30 upriver)
- Original Proposed Sediment FSP Grab Sample Location (N=30 downtown reach, N=30 upriver)
- Areas of Soft Sediment Based on 2018 Hand Probing Data
- Buffer Based On Hard Bottom Designation
- Analysis Grid
- River Mile Marker
- Approximate River Centerline

Hand Probe Bottom Condition

- Soft (> 35% fines)

Historic Fines Percentage

- > 35%

Notes:

- Aerial Imagery provided by ESRI Basemaps 2017.
- Downtown Reach defined as (RM 11.8 -16.6) and the Upriver Reach (RM 16.6 - 28.4).
- RM - river mile.
- Biosonar® transducer used for mudline bottom hardness screening, followed by 18' long hand push probe, and visual confirmation using a ponar grab at soft sediment areas.
- Survey data in NAD 83 OSPN Intl.feet.
- The approximate lateral distance along the shore used to define the Analysis Grids was approximately 675 ft in the Downtown reach and 950 ft in the Upriver reach.
- Points were generated randomly inside the Hand Probe Thiessen Polygons within each of the Analysis Grids using the Create Random Points tool in ArcGIS 10. The 60 proposed grab locations were divided (30 ea) between the Downtown and the Upriver Reaches.

Proposed Downtown/Upriver Reach Surface Grab Locations (revised) RM 24 to 26

Portland Harbor Superfund Site
PDI Surface Sediment FSP

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Figure 4g

Path: D:\GIS\Portland Harbor\Proposed\GIS\Map_Series\Map_Series_4_Proposed_Upriver_Bottom.mxd

